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PETALOCRINUS MIRABILIS (*N. SP.*) AND A NEW AMERICAN FAUNA.

THE fossils described in the present paper were collected in Jones county, Iowa, by the junior author, Mrs. A. D. Davidson; the paper has been prepared by the senior author, Mr. Stuart Weller. The type specimens of the new species are deposited in Walker Museum at the University of Chicago.

The fauna of the Niagara period in America has much in common with that of the Wenlock limestone in England. There are at least thirty[1] species common to the two faunas, and the relationship is such as to make it seem most probable that during that period a shore line along which the fauna lived reached continuously across the Atlantic Ocean of today, joining the east American to the British regions. The fauna of the Gotland limestone of Sweden also has numerous species common to the Wenlock limestone and the Niagara. *Goniophyllum pyramidale* and the species of *Crotalocrinus* occur most abundantly in the Swedish beds though they are also present in the Wenlock limestone. The particular facies of the Silurian fauna containing *Goniophyllum* has not been generally recognized heretofore as American, and no crinoid has ever before been recorded which is at all closely related to *Crotalocrinus*.

Under these circumstances the discovery of a Silurian fauna in America containing specimens of *Goniophyllum* which cannot be separated specifically from those of the Swedish beds, associated with a crinoid whose nearest ally is *Crotalocrinus* is of extreme interest. Although it has seemed necessary to refer the crinoid not only to a distinct genus but even to a distinct family, it does not detract from the interest in the relationship of the faunas. It is well known that of all organisms which are preserved as fossils, none are more delicately adjusted to their environment than are the crinoids. Because of this it is not surprising that during a change or migration which did not even bring about a modification of the specific characters of the coral *Goniophyllum*, the generic and even family characters of the crinoid became modified. The peculiar family of *Crotalocrinidæ* has heretofore stood out alone among all the crinoids, and now a new family is discovered in America which is just as peculiar and whose bonds of relationship are strongest with the European *Crotalocrinus*.

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[1] Phillips Manual of Geol., Part II., p. 122 (1885).

Only a few of the most remarkable species of the fauna are described in the present paper. Corals are exceedingly abundant in the fauna, in fact it seems probable that these Iowa beds are the remnants of an ancient coral reef where many species of these animals flourished. It is hoped in the near future to make an exhaustive study of the whole fauna and its relationships.

PETALOCRINIDÆ (*n. fam.*).

No special description of the family will be attempted, all the characters, family, generic and specific, will be recorded under the description of the species.

PETALOCRINUS MIRABILIS (*n. gen. et sp.*).

Plate VI., Figs. 2–5.

The entire crinoid resembles a flower with five petals fully expanded, the five leaf-like arms representing the petals. The diameters of the calyces of the two perfect specimens in the collection with all the arms intact, are respectively $\frac{3}{16}$ and ¼ inch, the total expanse of the arms being ⅞ and 1⅛ inches. Some of the detached arms indicate individuals whose total expanse of arms was nearly two inches.

Calyx monocyclic, depressed. Basal plates 5, rhomboidal. In four of them the two outer edges are a little shorter than the inner; on the anal side the two outer edges are about equal to the inner. First radials resembling those in *Platycrinus*, a little wider than long, extending nearly horizontally from the basal plates. Second radials very short, free, as in *Platycrinus*, bearing the arms. They appear as thin plates intercalated

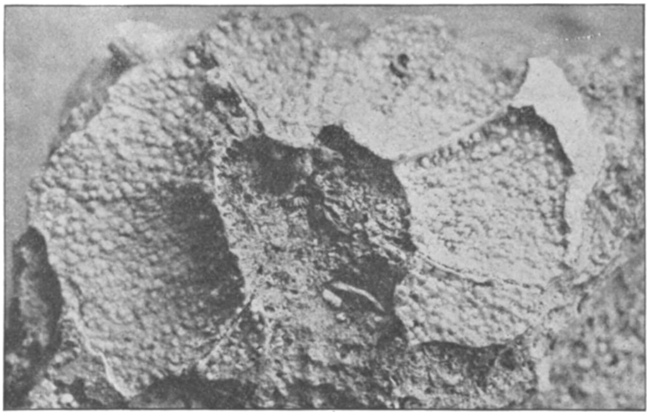


FIG. 1.

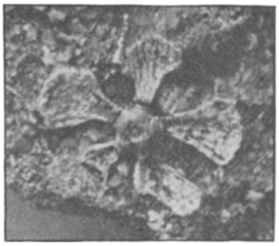
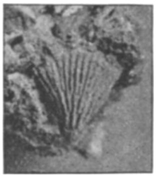


FIG. 2.



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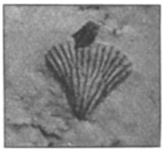
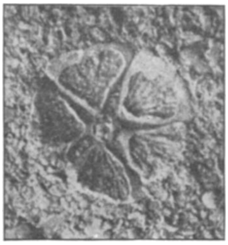


FIG. 4.



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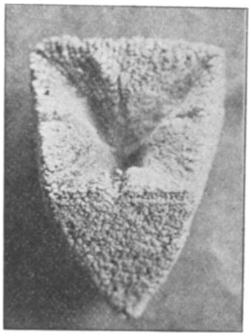

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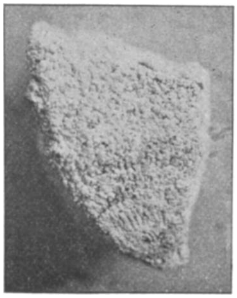

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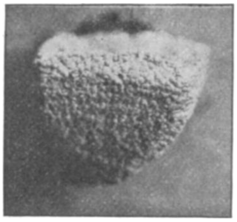

FIG. 8.

between the arm bases and the central portion of the outer edge of the first radials. No interradials observed on the dorsal aspect of the calyx. Ventral aspect unknown.

Arms triangular, leaf-like, rigid, gently curving dorsally. The plates composing them closely anchylosed, no sutures visible.[1] Dorsal side smooth, ventral side covered with longitudinal, rounded ambulacral grooves, separated by sharp ridges.

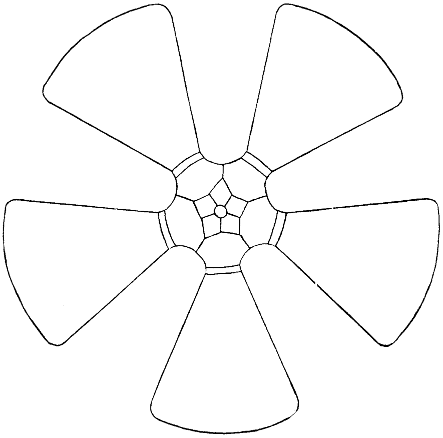

Fig. 1.—Outline view of the arrangement of the plates of the calyx and the relation of the arms to the calyx in *Petalocrinus mirabilis.*

Two ambulacral grooves start from the base of the arm, these bifurcate almost immediately, each of these four bifurcate and their branches bifurcate again, making sixteen ambulacral grooves at the distal edge of each arm.

Stem small, about one-sixth of the diameter of the calyx.

The structure of this crinoid does not conform to that of any described family, and it seems necessary to establish a new one for its reception. Were it not for the number of basals, the calyx alone would unhesitatingly be considered as belonging to *Platycrinus.* The most peculiar feature of the crinoid is its arms. In their broad leaf-like expanse they resemble somewhat closely those of the *Crotalocrinidæ*, but unlike the arms of the members of that family, they are perfectly rigid, standing out horizontally from the calyx and are entirely distinct from one another. They are also not nearly so greatly developed in *Petalocrinus* as in *Crotalocrinus.*

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[1] The specimens are silicified, and in the process of silicification the sutures may have been obliterated. In another condition of preservation they might be observed.

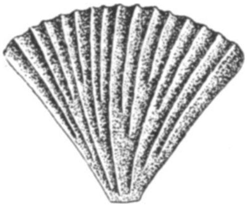

Fig. 2.—Idealized view of the ventral surface of an arm of *Petalocrinus mirabilis.*

The diameter of the stem is small, while in the *Crotalocrinidæ* it is almost as great as that of the entire calyx.

PETALOCRINUS (?) MAJOR (*n. sp.*).

Plate VI., Fig. 1.

A single imperfect specimen differs materially from the specimens of *P. mirabilis.* The calyx is entirely unknown, but from the arm structure it is placed provisionally in the genus *Petalocrinus.* The arms differ from *P. mirabilis* in being much larger and in being in lateral conjunction. The arrangement of the ambulacral grooves cannot be determined as the ventral surface is imbedded in the matrix. In the great expanse of the arms and their lateral conjunction this species approaches more nearly to the arm structure of *Crotalocrinus*, but differs from the species of that genus in their apparent rigidity.

GONIOPHYLLUM PYRAMIDALE[1] *Hisinger.*

Plate VI., Figs. 6–8.

829. *Turbinolia turbinata* var. *pyramidalis* Hisinger. Tableau des petrif. de Suede, Ed. 1, p. 22.

1831. *Turbinolia pyramidalis*, Hisinger. Tableau des petrif. de Suede, Ed. 2. p. 26.

1851. *Goniophyllum pyramidale* Milne Edwards & Haime, Polypiers fossiles, p. 404, Pl. 2, Figs. 4, 4*a*.

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[1] For a complete bibliography of *G. pyramidale*, see Dr. Lindström's paper on the operculate corals.

1882. *Goniophyllum pyramidale* Lindström, Palæozoiska Formationernas Operkelbärande Koraller, p. 43, Plates 1, 5, 6, 7, 8, 9.
1890. *Goniophyllum pyramidale.* Am. Geologist, Vol. VI., p. 326.

The presence of *G. pyramidale* in the Silurian rocks of America has not been generally recognized, the short note in the American Geologist, which simply records the presence of the fossil in Iowa, being the only reference known to the writer. Dr. Lindström states in a communication to the writer that he has a single specimen of the species from Tennessee, which does not differ from the Swedish ones.

Dr. Gustaf Lindström has made an exhaustive study of the operculate corals, and he recognizes three forms of this species from the Swedish Silurian beds, viz., "*Forma primigena,*" "*Mutatio prima,*" and "*Mutatio secunda.*" The Iowan specimens agree well with figures and descriptions and also with authentic Swedish specimens[1] of "*Mutatio secunda*" of Dr. Lindström. The species may be easily recognized by reason of its peculiar quadrangular form as shown in the figures. When perfectly preserved the calyx is covered by four triangular valves which form a pyramidal operculum. A single one of the Iowan specimens shows one of the operculum valves in position. The specimens vary among themselves in the amount of curvature and in the depth of calyx.

PENTAMERUS OBLONGUS *Sowerby*, *var.* CORRUGATUS, *n. var.*

Plate VII., Figs. 1–4.

This singular variety of *Pentamerus* is characterized by the criss-cross corrugation of the valves as is shown in the figures, and is apparently peculiar to this fauna. It is possible that it may become necessary to consider it as a distinct species, but as it does not differ from other variations of *P. oblongus* except in the criss-cross corrugation of the valves, and as this character is oftentimes faint or almost obsolete, it is thought best to accord to it but the taxonomic rank of a variety.

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[1] The writer is indebted to Dr. Lindström for authentic specimens of *G. pyramidale* from Gotland.

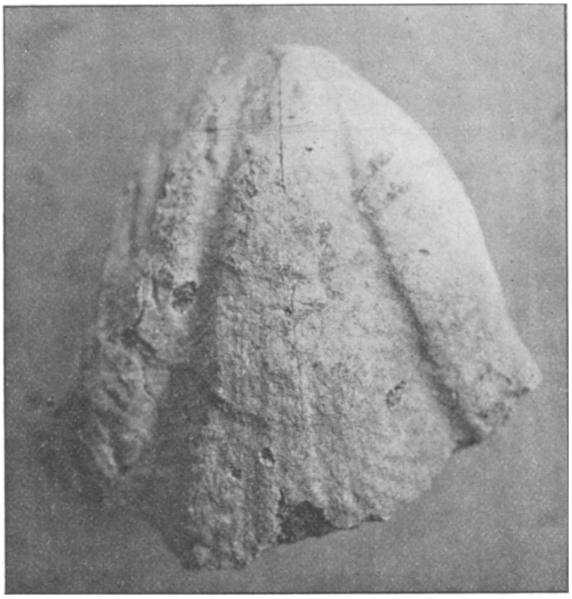
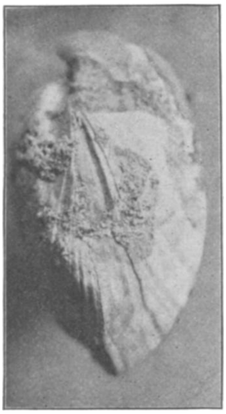


FIG. 1.



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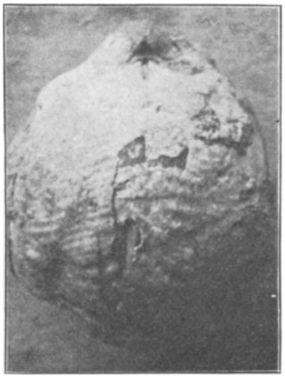

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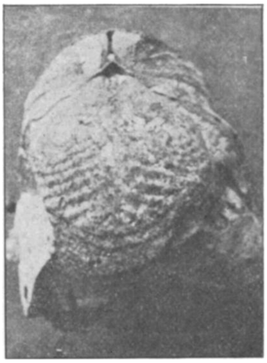

FIG. 4.

STRICKLANDINIA CASTELLANA *White.*

1876. *Stricklandinia castellana* (*N. S.*) White. Proc. Acad. Nat. Sci. Phil. p. 30.

1894. *Stricklandinia castellana* Hall & Clarke, Rep. N. Y. State Geol. for 1893, Vol. II., Pl. 49, Figs. 1–3, 5. (Handbook of Brachiopoda, Part II.)

As this species is found in association with the preceding it is thought advisable to make note of it here, and as the original description is somewhat inaccessible it is copied in full:

Shell moderately large, sublenticular, broadly subovate or subcircular in marginal outline; valves almost equally convex.

Dorsal valve usually showing a slightly elevated, indistinctly defined mesial fold, which is quite narrow upon the posterior portion of the valve, but widens towards the front, of adult shells; umbo broadly convex; beak not prominent.

Ventral valve usually having a slight flattening of the antero-median portion, corresponding with the indistinct fold of the other valve; umbo broadly convex; beak not prominent, projecting backward little if any beyond the beak of the other valve; area distinct, narrow, its length less than half the greatest width of the shell.

Surface of both valves marked by numerous, rather coarse, radiating, more or less recurving, angular or sharply rounded plications of unequal size and separated by spaces of unequal width.

Length and breadth of the largest example discovered, each forty-two millimeters; thickness, both valves together, twenty-one millimeters.

EXPLANATION OF PLATES.[1]

Plate VI.

Fig. 1. *Petalocrinus* (*?*) *major.*

Figs. 2–5. *Petalocrinus mirabilis.*

Figs. 2, 3. Two specimens showing all the arms in position.

Fig. 4. An impression in the chert of the ventral surface of a detached arm.

Fig. 5. Ventral surface of a detached arm.

Figs. 6–8. *Goniophyllum pyramidale.*

Plate VII.

Figs. 1–4. *Pentamerus oblongus var. corrugatus.*

Stuart Weller.
A. D. Davidson.

Laboratory of Palæontologic Geology,
University of Chicago.

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[1] All the figures are natural size.